Epitomes

Important Advances in Clinical Medicine

Neurosurgery

The Scientific Board of the California Medical Association presents the following inventory of items of progress in neurosurgery. Each item, in the judgment of a panel of knowledgeable physicians, has recently become reasonably firmly established, both as to scientific fact and important clinical significance. The items are presented in simple epitome and an authoritative reference, both to the item itself and to the subject as a whole, is generally given for those who may be unfamiliar with a particular item. The purpose is to assist busy practitioners, students, research workers or scholars to stay abreast of these items of progress in neurosurgery that have recently achieved a substantial degree of authoritative acceptance, whether in their own field of special interest or another.

The items of progress listed below were selected by the Advisory Panel to the Section on Neurosurgery of the California Medical Association and the summaries were prepared under its direction.

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Management of Intraventricular Hemorrhage in Neonates

INTRAVENTRICULAR HEMORRHAGE can occur in any neonate but premature infants are at greatest risk as the fetal brain contains a subependymal germinal matrix, a gelatinous structure that overlies the caudate nucleus and is separated from the the ventricular system by only a single layer of ependymal cells. At term the matrix is but a remnant whereas in premature infants this structure is large. Intracranial hemorrhage is usually preceded by a hypoxic-ischemic insult and may be followed by destruction of neuronal and glial precursors in the germinal matrix, destruction of brain parenchyma and hydrocephalus to a varying degree, depending on the magnitude of the hemorrhage. The immediate management of a neonate with intracranial hemorrhage is directed toward maintaining adequate cerebral perfusion and preventing conditions that might lead to further extension of the hemorrhage—such as arterial hypertension, hypoxemia, hypercapnia, acidemia and rapid changes in blood volume and osmolality. Neurosurgical treatment is limited to the hydrocephalus. The effectiveness of various methods of treating hydrocephalus is somewhat unclear because, with relatively the same amount of blood in the ventricles and subarachnoid spaces, the hydrocephalus will resolve on its own in some cases where it will progress in others.

The initial treatment of posthemorrhagic hydrocephalus is with repeated lumbar puncture. If the hemorrhage produces obstruction between cerebrospinal fluid in the ventricles and that in the lumbar region, lumbar punctures will be ineffective and it will be necessary to control the hydrocephalus by removing fluid directly from the ventricles. One way to accomplish this is with repeated ventricular taps but at the expense of additive parenchymal damage. An alternative procedure is to insert a ventriculostomy, which allows cerebrospinal fluid to continuously drain externally. This method obviates the need for multiple ventricular punctures but can be cumbersome, require particular attention to detail in its management and be complicated by infection, obstruction and dislodgement.

Another approach is to place a subcutaneous ventricular catheter reservoir that can be intermittently tapped percutaneously to remove cerebrospinal fluid. The design of smaller, more pliable reservoirs has eliminated the problems of skin or wound breakdown for even the smallest of premature infants. The reservoir can be aspirated daily for months without infection. Obstruction of the reservoir has not proved to be a problem in spite of the fact that the fluid can be very bloody and has a high protein content. The reservoir is very rarely tapped more than once a day, the hydrocephalus being controlled instead by increasing the amount of cerebrospinal fluid aspirated at each tap. The major drawback to using the reservoir is that the removal of fluid is intermittent. It is not known whether the fluid buildup and concomitant rise in intracranial pressure between taps are detrimental; clinical experience indicates that this is not a significant factor. If the hydrocephalus does not resolve, the reservoir can be converted to a ventriculoperitoneal shunt without a valve as an elective procedure.

Apparently the outcome of infants who have intraventricular hemorrhage depends more on the degree of intraparenchymal hematoma than the extent of the

ventricular clot or the degree of the ensuing hydrocephalus. Fortunately, a precipitous decline in the prevalence of severe intraventricular hemorrhage in preterm infants has been noted, the reasons for which are yet to be fully determined. J. GORDON McCOMB, MD

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Central Nervous System *Taenia solium* Infestation (Cysticercosis)

MIGRATION OF PERSONS from endemic areas is increasing the frequency with which central nervous system signs of infestation of the larvae of *Taenia solium* are encountered. Well-recognized manifestations include diffuse parenchymatous disease; calcified larval forms causing seizures; a basilar adhesive and racemose form, ventriculitis; intraparenchymatous disease with the formation of mass (cystic) lesions; intraventricular cysts, and spinal forms of both an inflammatory and a mass nature. The clinical manifestations include toxic encephalopathy with increased intracranial pressure, a focal neurologic deficit from intraparenchymatous disease, obstructive hydrocephalus from intraventricular disease or adhesive processes in the cerebrospinal fluid pathways, meningitis and spinal cord compression. These features may occur singly or in combination. Diagnosis is based on probable epidemiologic exposure, historical and physical findings, radiologic studies—specifically, computed tomographic (CT) investigation—and serologic examination. Palliative surgical therapy is appropriate for the relief of hydrocephalus when this is produced by ventriculitis or an obliterative inflammatory process involving the apertures of the ventricular system or the basilar cisterns (or both) and rarely for the excision of mass lesions when they present as focally dangerous mass processes. Surgical "cure" of intraventricular cysts may be expected if these are the only manifestations of central nervous system disease and if all such lesions are removed. This requires direct access to the cysts, which may be encountered—singly or otherwise—in the lateral, third or fourth ventricle.

Recent advances in our understanding relate to the recognition of more limited clinical syndromes produced by the death of intraparenchymatous larval forms. Such involution is presumably due either to the natural immunocompetence of the body or to the use of pharmacologic agents, or both. The progress of focal intraparenchymatous disease can now be observed by sequential CT scan study and shows a feature of the infestation not heretofore generally recognized. Thus, in contrast to the often overwhelming manifestations of diffuse parenchymatous involvement, the same inflammatory process, but of a more limited and localized kind, is being observed. Clinically and radiologically this process progresses to death of the larvae with establishment of the calcified state and with a quieting of the severe antigenic response (probably akin to a Jarisch-Herxheimer reaction). Whereas the control of such acute inflammatory features may be achieved with steroid therapy, recurrence often occurs unless larvacidal drugs are used. The derivative of pyrazinoisoquinoline (praziquantel) is now being applied in Mexico, South America and sporadically in the United States. The drug is of low toxicity and in incompletely "controlled" clinical experience is reported to be sufficiently promising to urge its use for almost all forms except strictly intraventricular cystic disease or masses causing spinal cord compression. Surgical palliative treatment for other causes of hydrocephalus may still be required. W. EUGENE STERN, MD

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Computed Tomography of the Spine

X-RAY COMPUTED TOMOGRAPHY (CT) has become the most useful tool for diagnosing spinal, intraspinal and paraspinal pathologic conditions. The technically advanced equipment rapidly generates highly detailed images of bone and soft tissue, enabling a multitude of uses in congenital, traumatic, inflammatory, neoplastic and degenerative diseases.

With complex spinal deformities or extensive tumors, in addition to the primary axial images, secondary images reformatted in coronal, sagittal or oblique planes are often useful. Reformatted images are also used when scan sections must be obtained oblique to the axis of interest.

Injecting the myelographic contrast agent, metrizamide, into the cerebrospinal fluid continues to add new dimensions to CT. This water-soluble, nonionic, radiodense agent, used in CT in volumes and concentrations much lower than those necessary for plain-film metrizamide myelography, defines the subarachnoid space, fills root sleeves, outlines the cord, conus, roots and cauda and fills the hydrosyringomyelic cavity. Metrizamide CT is often used as an adjunct to plain-film metrizamide myelography and in many instances replaces it.

The smaller doses of metrizamide CT produce significantly less morbidity, and newer agents with even fewer side effects are being developed. Low-dose metrizamide CT is gaining acceptance as an outpatient procedure.

In lumbar spondylosis and disc rupture, CT without the use of a contrast medium often produces diagnostic studies with more useful information than from conventional myelography; in many instances a surgical procedure for disc rupture or spinal stenosis is done on